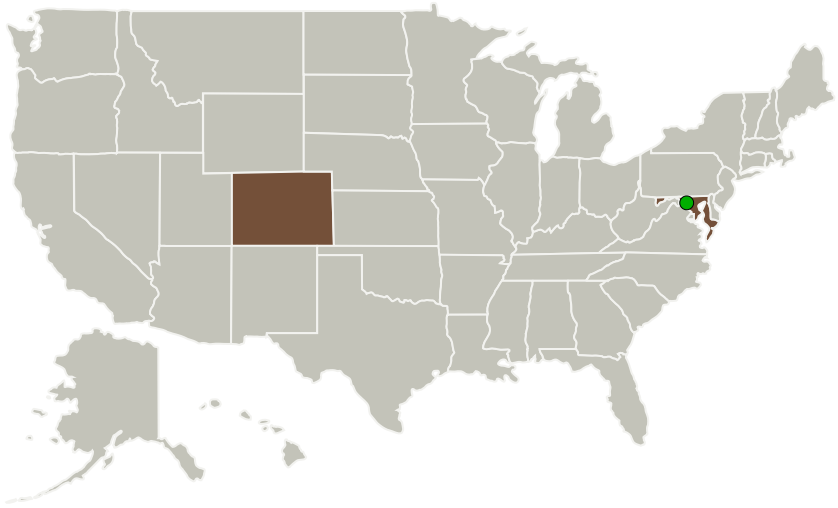
Soil Moisture Mapping sUAS, Phase II

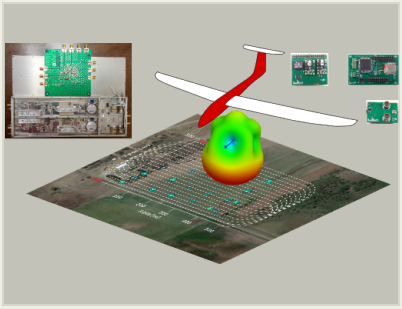
Completed Technology Project (2014 - 2017)

Project Introduction

Black Swift Technologies proposes the continued development, testing, validation, and delivery of the SuperSwift small Unmanned Aircraft System (sUAS), with a highly capable passive microwave radiometer to provide full coverage soil moisture measurements over an area of 400 acres per flight. Tight integration of the sensor with the sUAS avionics and airframe will enable precise flight control for low altitude missions in the range of 15m-30m above ground level (AGL) required for the sensor to accurately map soil moisture down to ~5cm in depth at up to a 15m resolution. The teams strong working knowledge of the regulatory environment surrounding sUAS will be used to inform the development of the system and associated concept of operations. This will facilitate safe and legal operation in the national airspace following FAA approval. The continued SuperSwift system development will address the design issues identified in Phase I. The stock airframe utilized in the Phase I study, the Tempest, while well qualified for use in preliminary flight testing, created additional challenges for integration of the soil moisture measurement payload. Due to the requirements of the radiometer antenna the Tempest was modified during Phase I to accomplish initial flight testing, but had several challenges including external placement of the antenna, more complex manufacturing of the control linkages for the rudder and elevator, and a soil moisture electronics payload that is deeply integrated into the airframe and difficult to remove for testing and replacement. These requirements drove the team to design a modified fuselage to be built in Phase II that involves a modified removable nose cone to house the entire sensor payload and converts the propulsion to a twin engine design on the wings.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Black Swift Technologies, LLC	Lead Organization	Industry	Boulder, Colorado
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Colorado	Maryland

Project Transitions

April 2014: Project Start

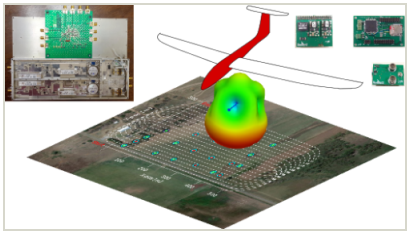
January 2017: Closed out

Closeout Summary: Soil Moisture Mapping sUAS, Phase II Project Image

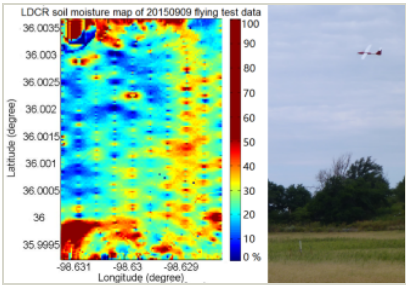
Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/137601)*

Images



Briefing Chart Image
Soil Moisture Mapping sUAS, Phase II
(https://techport.nasa.gov/image/129627)



Final Summary Chart Image
Soil Moisture Mapping sUAS, Phase II Project Image
(https://techport.nasa.gov/image/127718)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Black Swift Technologies, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

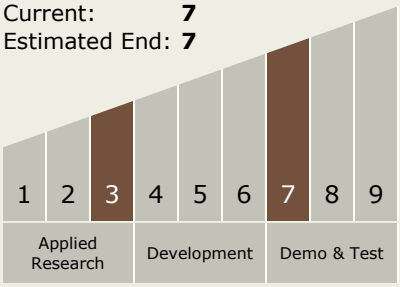
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Maciej Stachura

Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**



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Completed Technology Project (2014 - 2017)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System